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FINAL REPORT

EVALUATION OF THE NIGHT HAWK SYSTEM

ACTIV PROJECT 2/70I

APPROVED: 30 JAN 1970

C.B. McCOID
Colonel, IN
Commanding

AVHGC-DST (30 Jan 70) 1st Ind
SUBJECT: Final Report - Evaluation of the Nighthawk System

Headquarters, United States Army, Vietnam, APO San Francisco 96375 [illegible] MAY

TO: Commander in Chief, United States Army, Pacific, ATTN: GPOP-DT, APO 96558

1. Concur in the comments and recommendations contained in the attached ACTIV Final Report of the Nighthawk System.

2. BOI as recommended in the final report generally agrees with that adopted by USARV. The established USARV BOI for 58 systems was developed based upon stated unit requirements and is attached as Inclosure 1. This BOI only established an authorization for the AN/VSS-3 searchlight. The remaining components must be taken from units' operational assets.

3. Fabrication of one Nighthawk system requires removal of components from three weapons systems (M21, M23, and XM27E1), rendering these systems inoperative and not available for their intended use. Should the Army accept Nighthawk as a system, the components required for fabrication must be provided as an authorized overage and not taken from operational assets.

4. Request one copy of the CINCUSARPAC forwarding indorsement be provided this headquarters, ATTN: AVHGC-DST and one copy be provided CO, ACTIV.

FOR THE COMMANDER:

D. J. WINTER
1LT, AGC
Assistant Adjutant General

1 Incl
as

NIGHTHAWK BOI

UNIT	BOI
1st Cav Div (AM)	10
101st Abn Div	9
25th Inf Div	4
Americal Div	4
199th LIB	1
3d Bde, 9th Inf Div	1
173d Abn Bde	1
1st Bde, 5th Inf Div (Mech)	1
11th ACR	3
12th CAG	8
17th CAG	5
164th CAG	9
165th CAG	1
212th CAB	1
TOTAL	58

AUTHORITY

Disposition Form, AVHGC-O, Headquarters, US Army, Vietnam, 14 September 1969, subject: Evaluation of AN/VSS-3 Searchlights in Helicopter .

ACKNOWLEDGEMENTS

The Army Concept Team in Vietnam gratefully acknowledges the outst nding support provided by the officers and men of the following units tha participated in the Night Hawk Evaluation:

1st Infantry Division

25th Infantry Division

3rd Brigade, 9th Infantry Division

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ABSTRACT

The Night Hawk system was evaluated by ACTIV during the period 1 October to 30 October 1969. The purpose of the evaluation was to determine the suitability of the Night Hawk system for combat operations in the Republic of Vietnam (RVN) and, if acceptable, to recommend a basis of issue (BOI). The Night Hawk system was evaluated during night operations by three units located in the III Corps Tactical Zone. Analysis of evaluation data resulted in the following recommendations:

a. That the Night Hawk be adopted as an interim system for use by units throughout RVN. Recommendations should be implemented immediately to permit earliest practical application within USARV.

b. That the Night Hawk system be assigned and distributed in accordance with the following BOI:

TYPE UNIT	NUMBER OF NIGHT HAWKS
Airmobile Division	8
Infantry Division	4
Separate Brigade	1
Armored Cavalry Regiment	2
Separate Air Cavalry Squadron	3
Combat Aviation Groups	(Depending on mission requirements)

c. That the development of a standardized Night Hawk mounting kit be initiated as a VLAPA item.

d. That the feasibility of developing a portable gunner's seat, to meet appropriate safety standards, be investigated.

e. That the Big Screen Observation device be incorporated in the Night Hawk system to replace the AN/TVS-4.

f. That the doctrine for employment of this system state explicitly that it will be normally employed with an escort helicopter.

g. That a flash suppressor for 7.62 minigun, corresponding to the type being tested by the Research and Engineering Directorate, Aircraft Weapons Systems Laboratory, Guns and Components Branch, US Army Weapons Command, Rock Island, Illinois, be procured.

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1. REFERENCES

a. Message, 060692, AVGBC-A, Headquarters, II Field Force, Vietnam, 30 June 1969, subject: Equipment for Night Operations.

b. Message, 080574, AVGBC-A, Headquarters, II Field Force, Vietnam, 29 August 1969, subject: Allocation Priority (Xenon Light, Mounts and Miniguns for Night Hawk Systems).

c. DF, AVHGC-CC, Headquarters, US Army, Vietnam, 14 September 1969, subject: Evaluation of AN/VSS-3 Searchlight in Helicopters.

2. PURPOSE

The purpose of this evaluation was to determine the suitability of the Night Hawk system for combat operations in RVN and, if found acceptable, to recommend a BOI.

3. OBJECTIVES

a. Determine the suitability of the Night Hawk system mounted in the UH-1 helicopter for target acquisition and destruction.

b. Determine and document the employment techniques developed by the units that employed the Night Hawk system.

c. Determine the logistical support requirements of the Night Hawk system.

d. Recommend a BOI for the Night Hawk system, if found suitable for employment in RVN.

4. BACKGROUND

a. Since the beginning of the Vietnam conflict, the enemy has used darkness to conceal movement of troops and supplies. This has enabled him to sustain some degree of guerrilla warfare throughout RVN. One means of detecting and limiting the enemy's capability to move freely at night is an airborne observation system. Several systems have been employed and evaluated by the Army during the past five years:

(1). Helicopter Illumination System (a cluster of seven C-123 landing lights).

(2). 1.6KW Xenon, lightweight, helicopter-mounted searchlights (ENSURE 260).

(3). AN/ASS-1 searchlight.

(4). Spectrolab, FX-150 20KW searchlight.

(5) Night Hawk system.

b. The first four systems provided some capability for night operations, but they were not completely satisfactory. The Night Hawk system, incorporating the best ideas of previous systems, was designed and built by the 25th Infantry Division. This new system combined, as a package, in one helicopter, a covert and white light illumination capability with an extremely accurate, high rate of fire weapons system. Other units soon copied the design and began using it. Units employing the Night Hawk system enjoyed such initial successes that the CG, II Field Force, Vietnam, requested additional systems for operational use. This request was approved for a total of 36 systems. ACTIV was directed to conduct an informal evaluation using the first nine systems made available.

5. SCOPE

Nine Night Hawk systems employed by three units were evaluated for 30 days. No part of the evaluation was controlled for the sole purpose of data collection. All data was derived from the results of missions flown in support of tactical operations.

6. DESCRIPTION

a. As shown in Figure I-1 the Night Hawk system consists of a UH-1D/H helicopter with three major components mounted at one side and operated by two crewmen in the cargo compartment. The three major components consist of an AN/VSS-3 searchlight, an AN/TVS-4 night observation device (NOD) coupled by a common framework on the door gunner's pintle and the M134 7.62 minigun. The minigun is attached to a pallet located in the forward area of the cargo compartment. The entire system can be mounted on either side of the helicopter, or two systems can be mounted in the same aircraft.

b. The AN/VSS-3 Xenon Searchlight is a component of the Sheridan Armored Reconnaissance Vehicle. It provides both visible and infrared light in a narrow or spread beam. Beam width is adjustable from 1.5° to 6.5°. Approximately 2 seconds are required to change from one light mode to the other, and the same time is required to change beam width. A change in light modes is controlled by activating a toggle switch which allows a sleeve type infrared filter to extend over or retract from the light source. The light requires approximately 1.6KW input power, which is provided by the aircraft's 28 VDC generator. Weight of the searchlight with auxiliary attachments is 90 pounds.

c. The AN/TVS-4 NOD is a battery powered, 7.5 power, monocular image intensifier with a field of view of 8°. It weighs 34 pounds. The NOD is mounted above the searchlight in a common frame. The frame weighs approximately 35 pounds, and is so designed that the two components remain aligned as they are swiveled in search of targets.

d. The armament system is shown in Figure I-2. It consists of the M134 minigun, feeder - delinker mechanism, and ammunition containers from

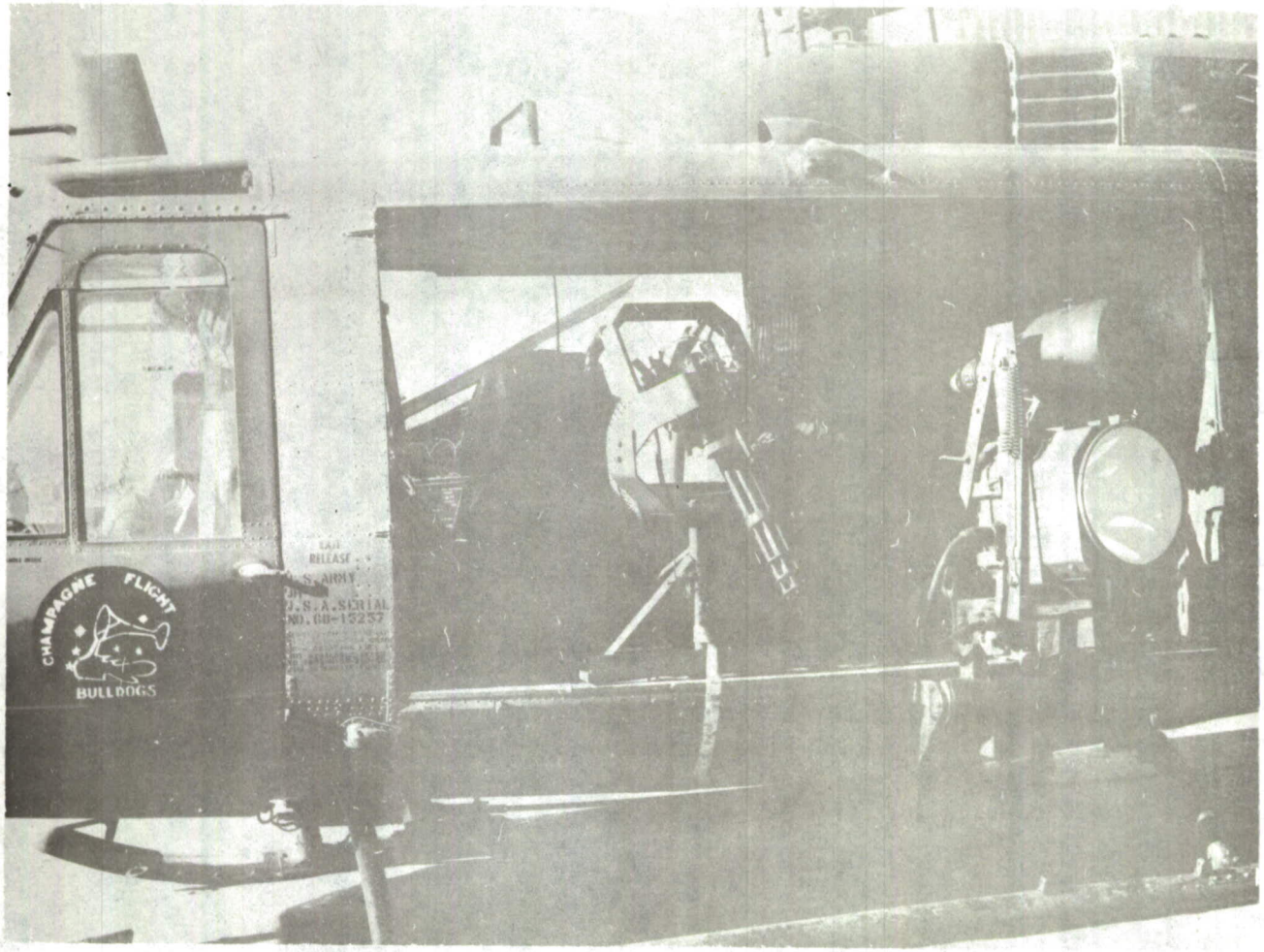


FIGURE I-1. The Night Hawk System.

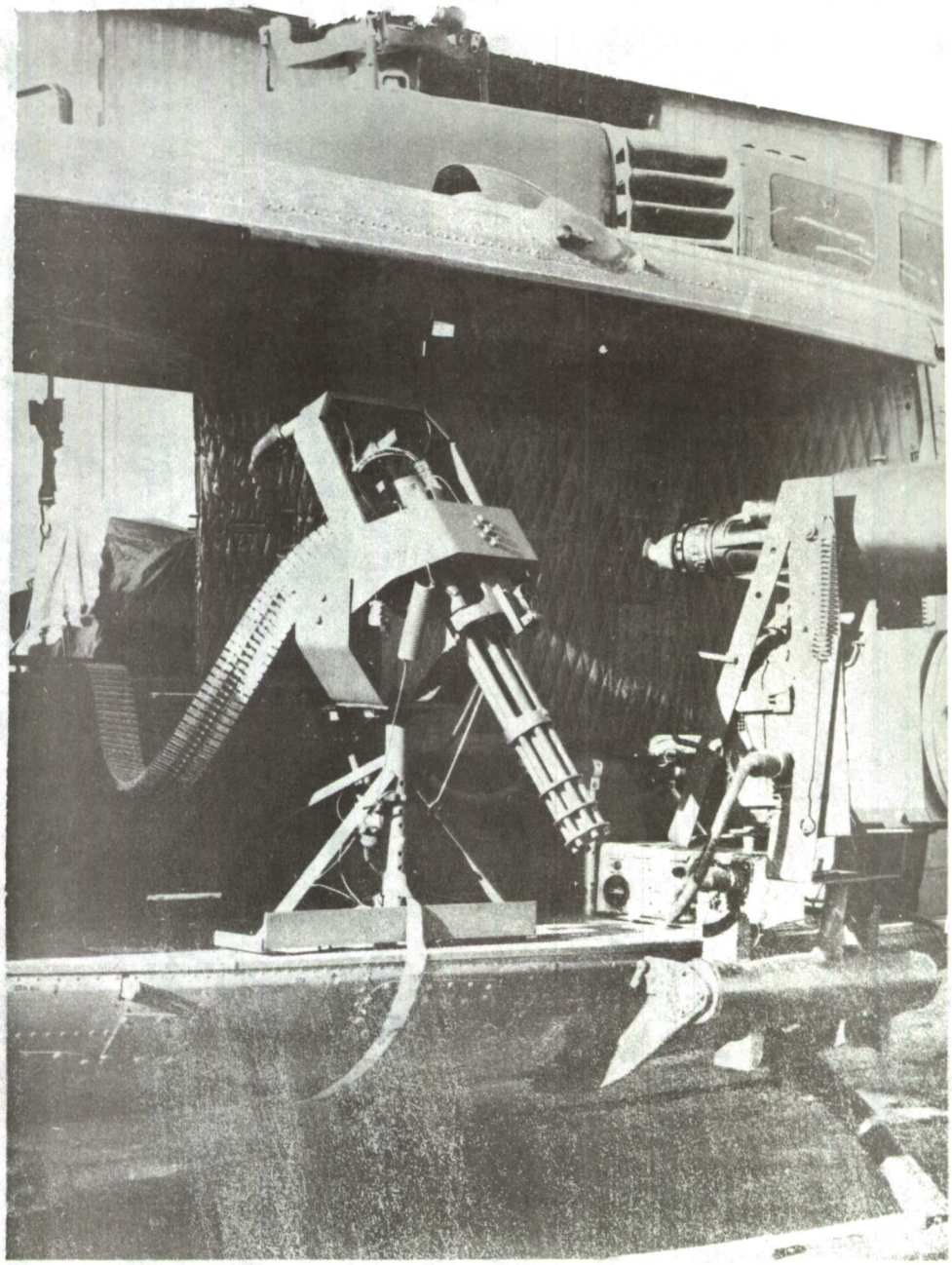


FIGURE I-2. Armament System

the XM27E1 armament subsystem. The pintle post upon which the weapon is mounted is anchored to a pallet that can be set in the forward area of the UH-1 cargo compartment and bolted to the floor or secured with cargo straps. Ammunition capacity is 2000 rounds. The selective rate of fire is 2000 or 4000 rounds per minute. Electrical power is provided by the aircraft's 28VDC generator. The total weight of this system fully loaded is approximately 245 pounds. Stops are included in the system mount to limit the range of the miniguns vertical and horizontal movement.

7. APPROACH

Judgments of operability of the Night Hawk system were obtained from the users of the equipment. Users indicated their judgments by placing a checkmark in one of ten value intervals along a scale ranging from "difficult" to "easy". This technique allowed evaluators to quantify the sampled factors. The same method was used to obtain operator judgments on the adequacy of equipment technical performance. Specific difficulties experienced in the use of the system were identified and described. Information on employment, maintenance and BOI was obtained from interviews, observation and questionnaires.

8. ENVIRONMENT

The 1st and 25th Infantry Divisions were located in the III Corps Tactical Zone with headquarters at Lai Khe and Cu Chi, respectively. The mission of these units was to conduct stability operations within assigned areas of operation. The terrain within the area varied from flat to moderately hilly, with vegetation ranging from sparse cover to heavy forest, including many interspersed plantation groves. The 3d Brigade, 9th Infantry Division was located in the southern part of the III Corps Tactical Zone with its headquarters at Tan An. The terrain in this area was similar to that of the Mekong Delta region: flat and generally less than one meter above sea level, with vast networks of rivers and canals. Enemy activity throughout the III Corps Tactical Zone was light throughout the evaluation. Weather was influenced by the Southwest monsoon which was in its final state of transition. Rainfall had diminished considerably, but late afternoon and early evening thundershowers occurred almost daily. Toward the end of the evaluation, skies at night were generally clear with unrestricted visibility. Atmospheric conditions i.e., fog and haze, had some adverse effect on Night Hawk operations, particularly in the early hours of darkness.

9. DATA COLLECTION AND ANALYSIS

Each evaluating unit appointed one evaluator to insure that questionnaire forms were distributed to all personnel, properly completed, collected and submitted to the ACTIV project officer. The ACTIV project officer and unit evaluators participated in Night Hawk operations during the data collection phase. At the end of the evaluation all available aviation and ground unit commanders who participated were interviewed to obtain additional subjective

data upon which to base conclusions for this report. The two principal techniques used to evaluate data were: Analysis of user observations and military judgment applied to quantified data. Data pertaining to operability and system technical performance were summarized by category and presented as frequency distributions. The percentage of judgments in each category was also determined.

SECTION II

OBJECTIVE 1 - SUITABILITY OF NIGHT HAWK

10. OPERABILITY

Figure II-1 shows the distribution of crew member judgments of operability (ease of control) of the NOD and the minigun. Judgments were indicated on the ten-step scale. The scale ranged from "very difficult" to "easy". The number of responses is shown in the vertical axis of the figure. Percentage of responses to a given category is indicated at the top of each column. For the NOD, 93 percent of the judgments fell in the five categories from "somewhat difficult" to "easy" to use. The two categories closest to the "easy" end of the scale contained 65 percent of the total of 179 responses. For the minigun, 85 percent of the judgments fell in the five categories at the favorable end of the scale. The two categories closest to "easy" contained 55 percent of the total of 293 responses. The median (point above which 50 percent of the responses fall) is indicated on the figure. Problems as described below were encountered at the beginning of the evaluation; of these many were corrected prior to its conclusion.

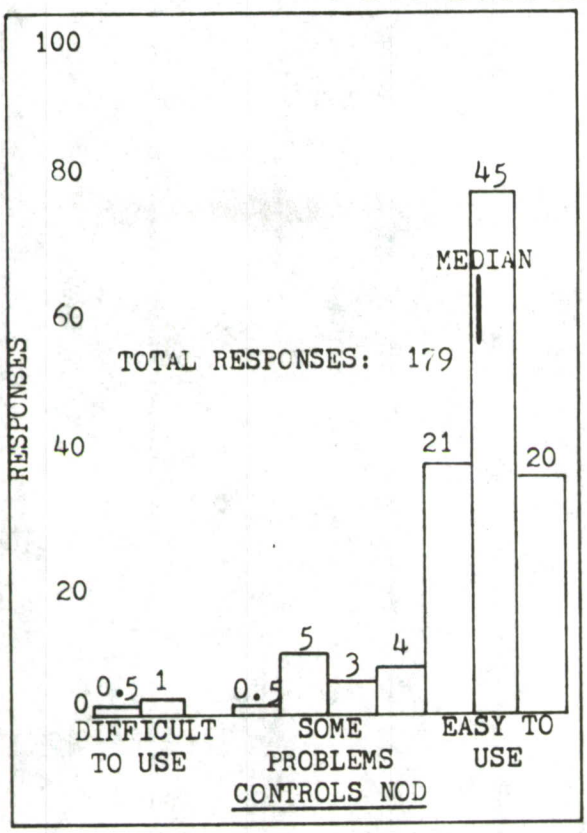
a. During firing, the minigun had a tendency to elevate due to recoil forces. It was difficult for the gunner to anticipate and counteract this effect. To offset this problem, two springs were attached to the front of the mount as shown in Figure II-2. These springs are the same type as used on the UH-1 cargo hook release.

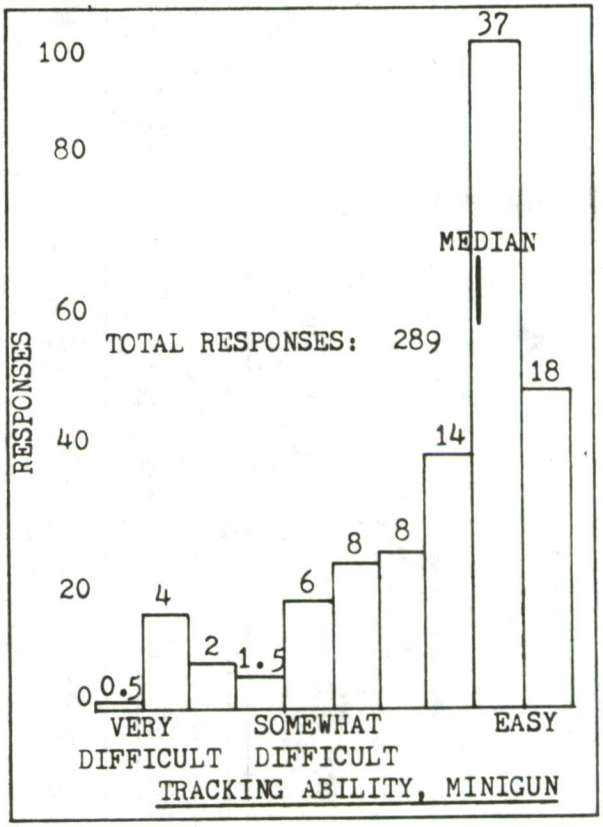
b. Design of the mounting for the searchlight/NOD did not allow the horizontal pivot axis to pass through the center of mass. By placing the horizontal axis above the center of mass the observer was able to reach the NOD throughout its range of movement; however, it required a considerable amount of force to depress the system and hold it at a normal operating angle for any length of time. The type springs installed on the minigun were also attached to the front side of the searchlight/NOD system to relieve the pressure. See Figure II-3.

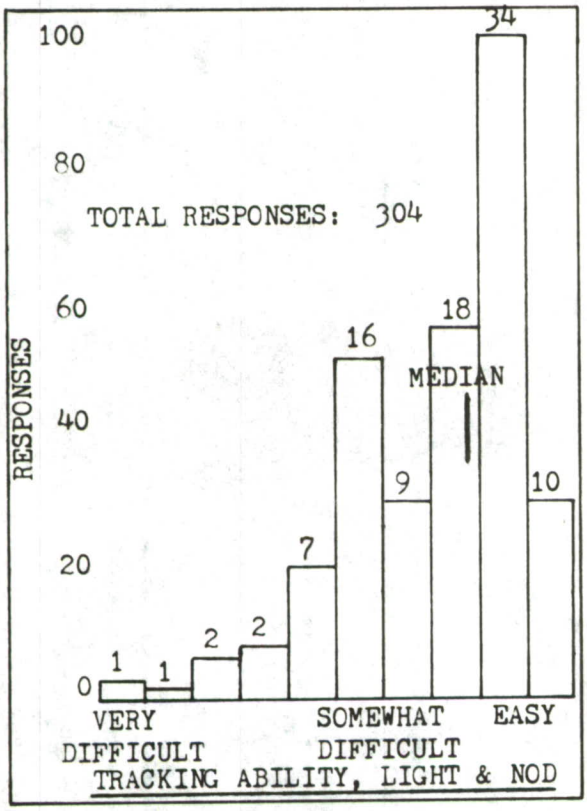
c. The gunner and observer each needed an interphone switch on the floor to allow them the use of both hands. No satisfactory solutions were found for this problem.

d. Crew members experienced difficulty from muzzle flash. It was so intense that all crew members lost sight of the ground as the weapon commenced firing. An effective flash suppressor is required.

e. As the Night Hawk is presently configured, gunners do not have seats. The minigun mount utilizes two of the hold down posts normally used for the jump seat. Makeshift seats of wooden boxes and other items have been used but none were considered satisfactory. This condition constituted a crew safety hazard. The gunner should have a seat that comfortably positions him behind the minigun and provides a seat belt or restraining harness.







NOTES: a. Percentage of each response indicated at top of column.

b. Ten arbitrary categories of response are used to represent the continuous variation of user opinion.

FIGURE II-1. Distribution of Crew Member Judgments of Operability

FIGURE II-2. Minigun with Spring Modification

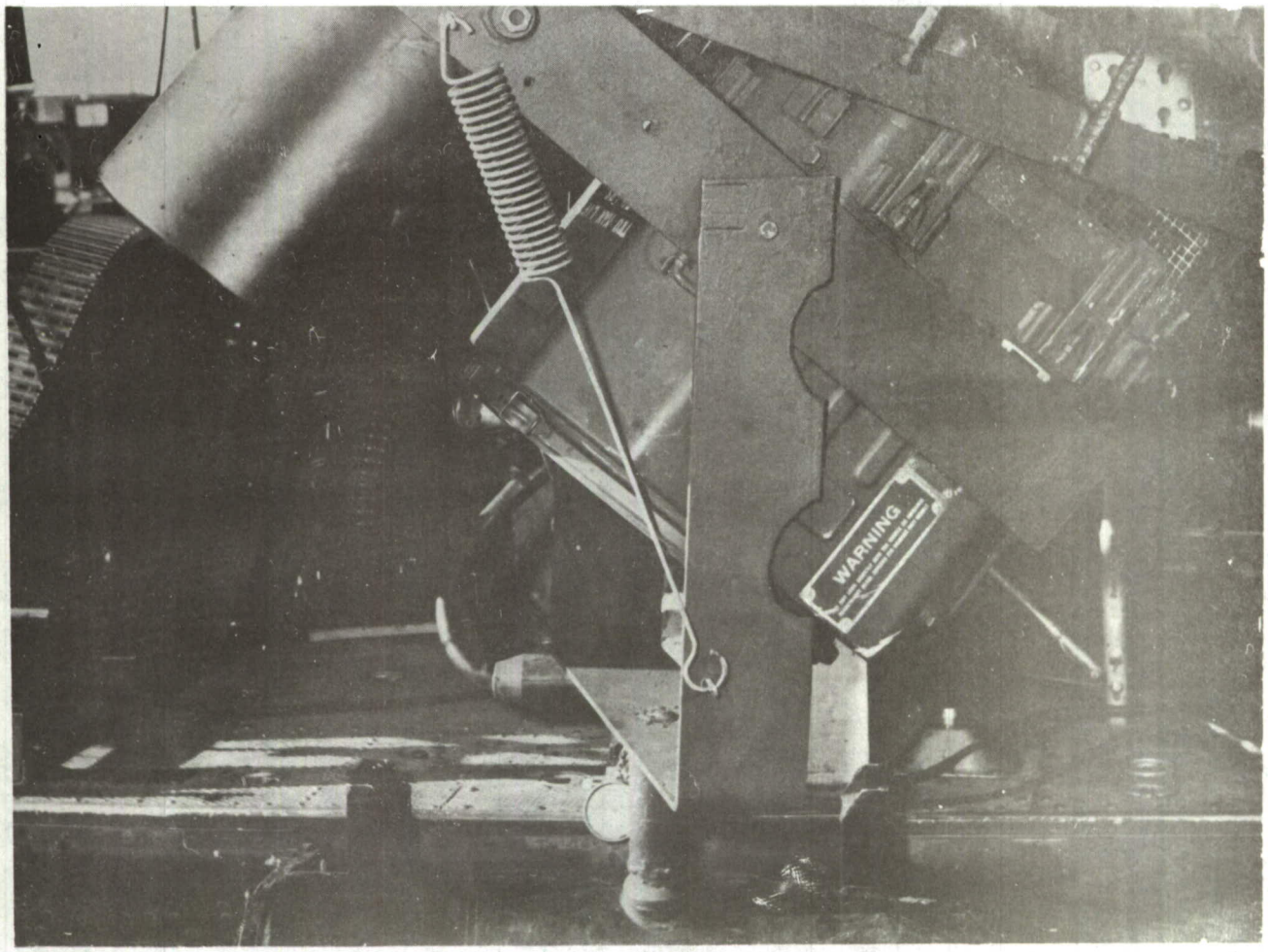


FIGURE II-3. NOD/Searchlight Modified with Springs Added.

f. The observer was unable to talk over the interphone system while his eye was at the NOD because his head was out in the wind stream. Sponge rubber covers for the boom microphone were tried but proved to be unsuitable. A throat or other type microphone is necessary to enable the observer to communicate without removing his eye from the NOD. A possible solution to this problem might be found by substituting the Big Screen Night Observation device for the AN/TVS-4 NOD. The Big Screen NOD is similar to the AN/TVS-4. It offers an improved viewing system by projecting a target image on a 5-inch screen. This improvement permits more comfortable viewing for the operator. The advantages offered are: the operator can use both eyes to view the screen from a distance of 12 to 24 inches, move his head freely and is subject to less eyestrain. Other improvements include an adjustable light intensity and image magnification system and a red screen filter. See Figure II-4.

g. Some common causes for minigun stoppages and steps taken to restore firing are listed below:

(1) Falling expended links were blown into the rotating mechanism. To rectify this problem, a locally fabricated chute or the same chute used with the XM27E1 was attached to the minigun to direct expended links away from the weapon.

(2) Drive cables frequently broke due to sharp bends which occurred as the minigun was swiveled. Particular attention was paid to this problem during installation and routing of the drive cable.

(3) Feeder-delinker malfunction, though not exclusively peculiar to the Night Hawk system, was the cause of many minigun stoppages. All ammunition loaded for the minigun had to be carefully inspected to prevent this.

11. SYSTEM TECHNICAL PERFORMANCE

a. AN/TVS-4 NOD

(1) Of the three major components of the Night Hawk system, the NOD is the most limiting with respect to system employment. Given any set of conditions -- operator proficiency, ambient light, visibility and terrain -- the ability to use the system effectively will be determined by the aircraft's altitude (because the NOD has a limited range) versus apparent ground speed. At any ground speed, the closer the helicopter is to the ground, the more rapidly objects below appear to move. As this rate of apparent movement increases, the NOD operator will have greater difficulty in focusing and may experience nausea. In order to offset this problem, it was necessary to select an optimum trade-off between altitude and ground speed.

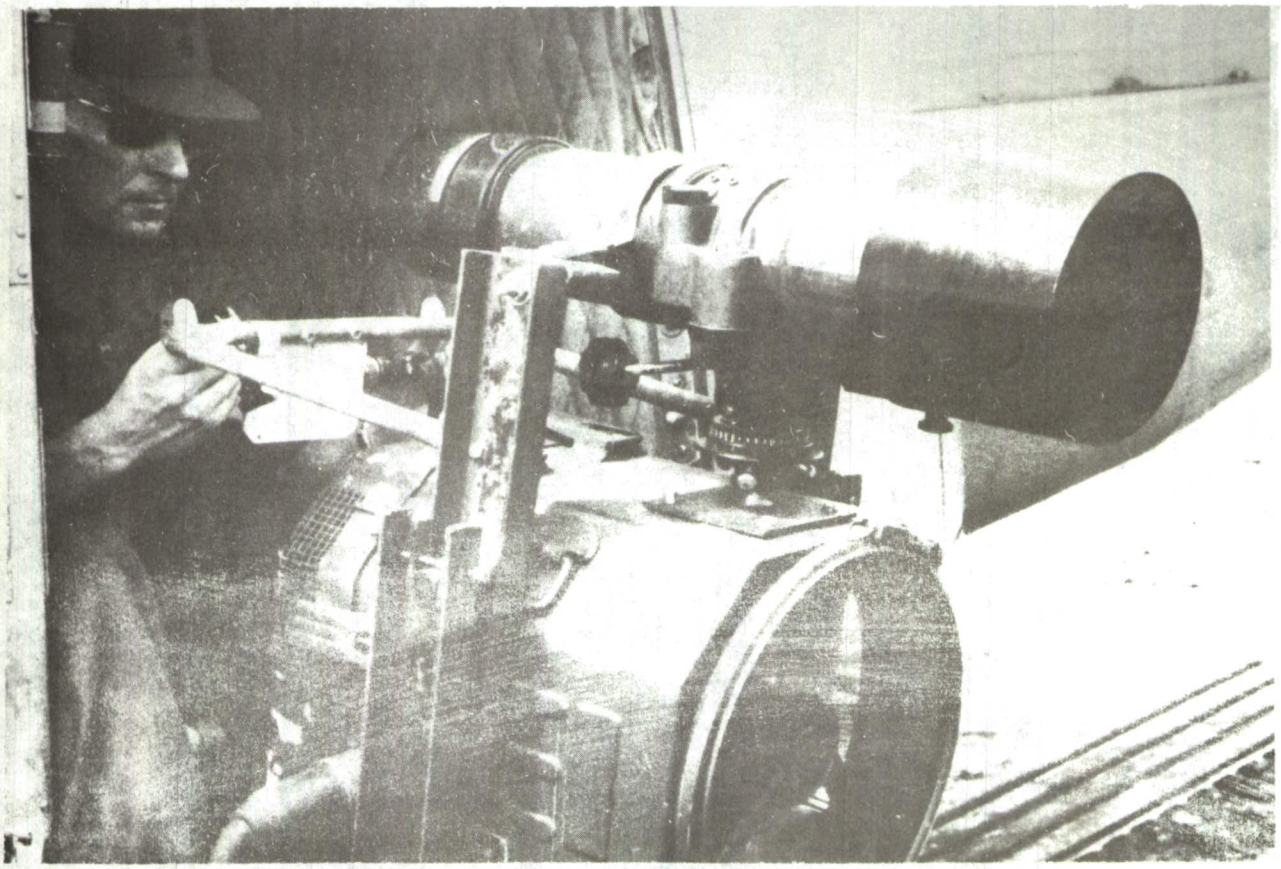


FIGURE II-4. Installation of Big Screen Viewer in Place of the AN/TVS-4.

(2) Approximately 20 hours of operator training on use of the NOD is necessary before a Night Hawk crew can be effective. The searchlight/NOD operator is the most important member of the Night Hawk crew. Figure II-5 depicts the distribution of operator judgments of the adequacy of the field of view of the NOD. The ten-step scale ranged from "too little" through "correct" to "too large". The two categories closest to "correct" contained 69 percent of the total of 173 responses. The following problems were encountered with the NOD:

(a) Colors appeared as various shades of green. Resolution was difficult even under the best conditions; and there remained a constant requirement to change focus on target images due to variation of altitude. Movement over the ground often caused the image to dance and rush by, which resulted in operator nausea.

(b) Since operating conditions cause a great deal of operator fatigue, additional crewmen require training in the operation of the NOD/Searchlight in order to rotate duties.

(c) There was no brightness control on the NOD. This control device was required to improve performance under certain conditions of ambient and artificial illumination.

(d) Operator eye fatigue and communication problems caused by rushing wind were directly attributable to the NOD. However, late in this evaluation the 25th Infantry Division employed a Big Screen Night Observation device, shown in Figure II-4, in place of the AN/TVS-4. This alternate system was preferred by all crew members who used it.

b. AN/VSS-3 Searchlight

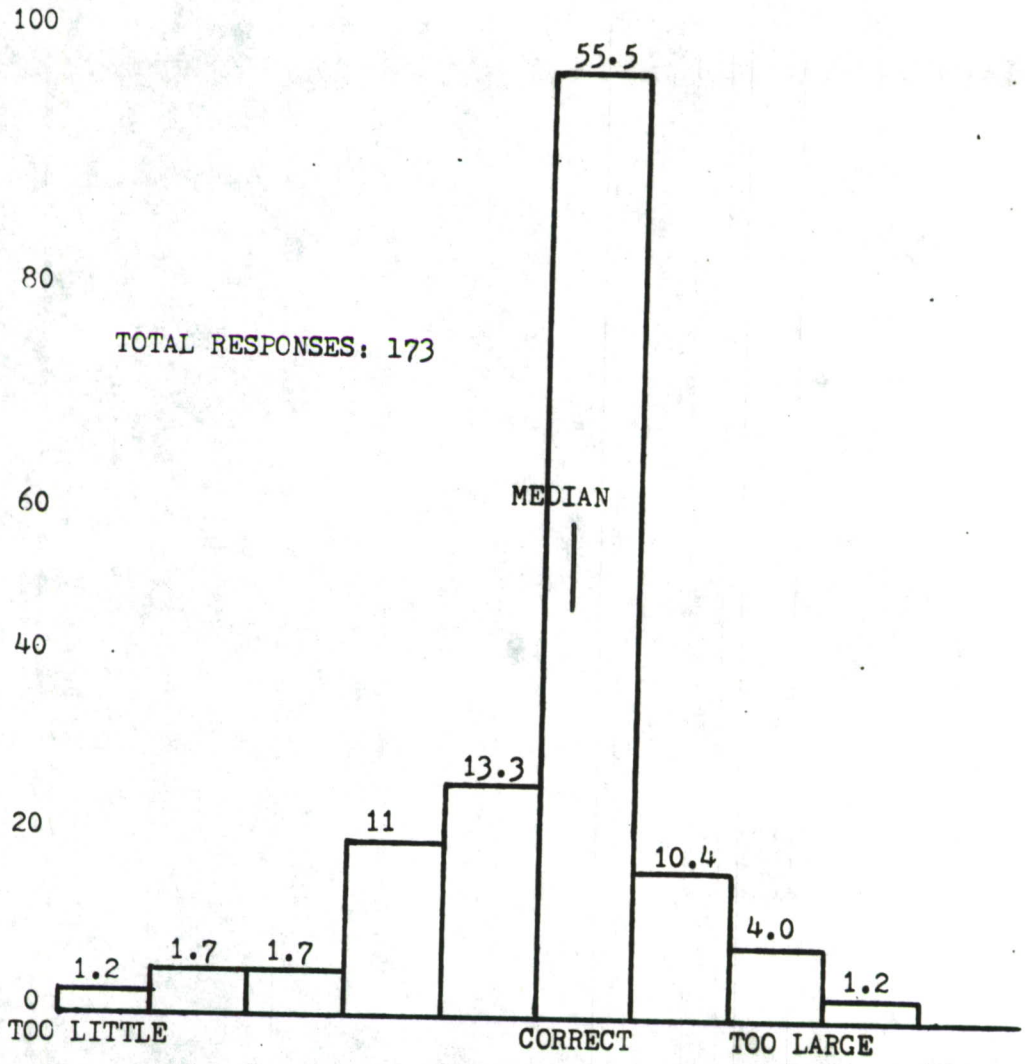
(1) Although designed and built for use on an armored reconnaissance vehicle, the AN/VSS-3 searchlight was easily adapted for use on the helicopter, however, there are minor installation problems.

(2) Although its beam spread was quite narrow (1.5° to 6.5°), the AN/VSS-3 illuminates sufficient area when employed with the Night Hawk system. Light intensity was more than sufficient at operating altitudes of 500 to 700 feet. Figure II-6 depicts the distribution of operator judgments of the adequacy of the searchlight.

c. M134 Minigun

(1) The minigun was ideally suited for use in the Night Hawk aircraft. It provided a high rate of fire with good area coverage and effectiveness from normal altitudes of employment.

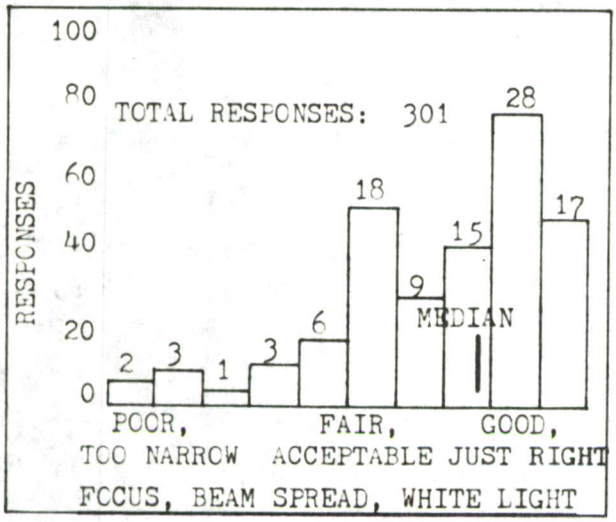
(2) Due to the small amount of ammunition carried, firepower was limited but well suited for the types of targets normally encountered. Most encounters consisted of small groups of personnel or sampans. Larger elements of troops and fortified emplacements required support from armed helicopters or artillery.

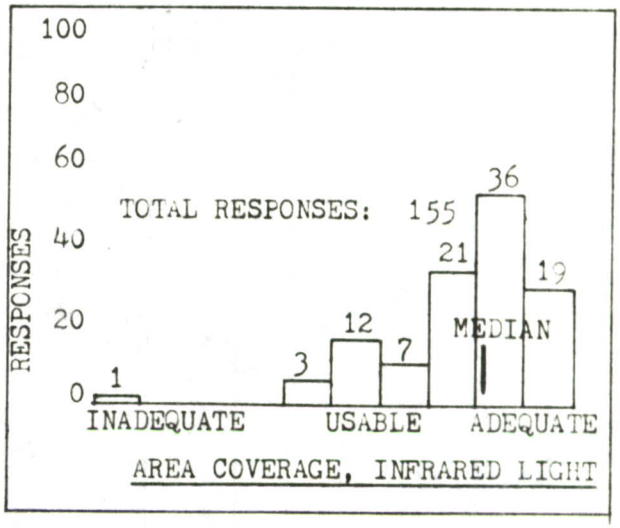


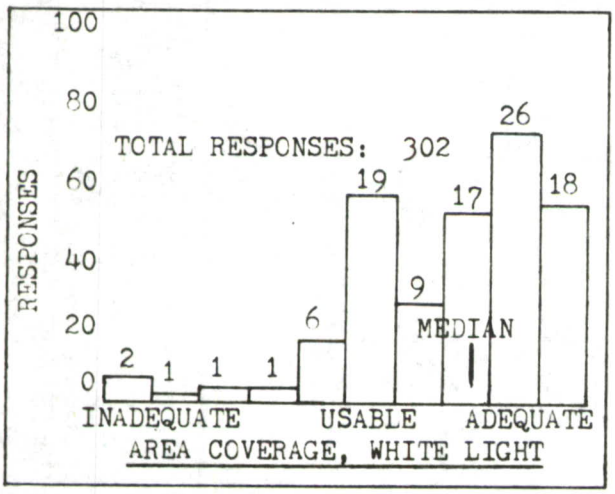
NOTES: a. Percentage of each response is indicated at top of column.

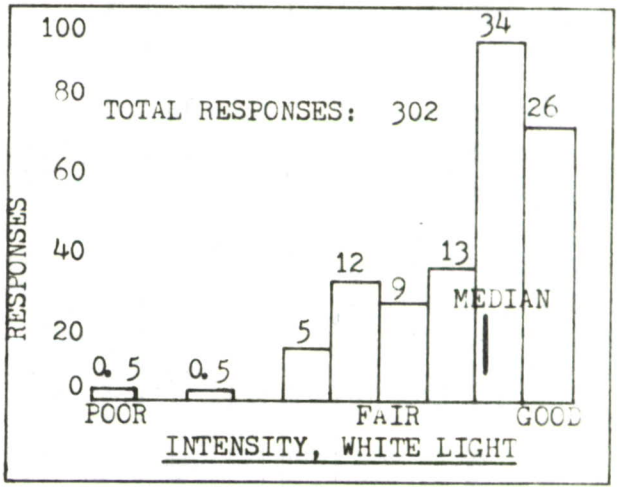
b. Ten arbitrary categories of response are used to represent the continous variation of user opinion.

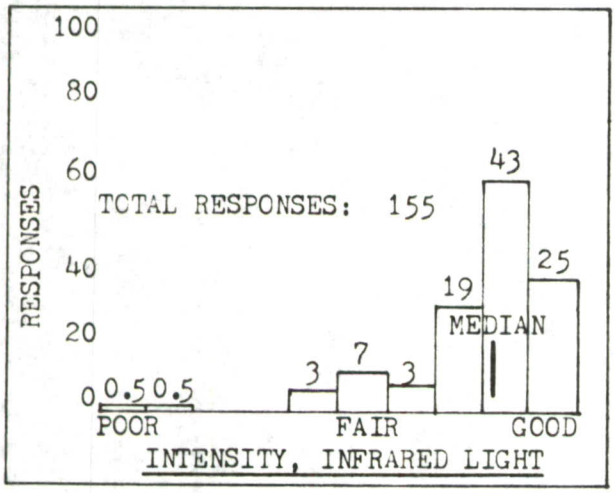
FIGURE II-5. Distribution of Crew Member Judgments of Field of View.











NOTES: a. Percentage of each response is indicated at top of column.

b. Ten arbitary categories of response are used to represent the continuous variation of user opinion.

FIGURE II-6. Distribution of Crew Members' Judgments of AN/VSS-3 Performance.

(3) Some of the nine systems evaluated were equipped with M21 ammunition containers loaded with 4000 rounds of ammunition. Others used XM27E1 ammunition containers with 2000 rounds. In order to extend the use of available ammunition, the slower rate of fire (2000 rounds per minute) was normally used. Reloading required excessive time unless preloaded ammunition containers were available. The average time to rearm was 30 minutes.

12. FINDINGS

a. All components of the Night Hawk required well-trained individuals to operate them effectively.

b. Many minor problems had to be overcome before the Night Hawk became a suitable system for night operations.

c. Crew inter-communications were inadequate. The gunner and observer could not communicate adequately with other crew members while keeping both hands on their equipment.

d. The NOD is the crucial component of the Night Hawk system because of its operational limitations.

e. Muzzle flash from the minigun remains an unsolved problem area.

f. The majority of crew members sampled gave a favorable rating to the NOD and the minigun with respect to ease of control.

g. Most crew members judged the field of view of the NOD to be appropriate.

h. Most crew members judged the searchlight to be adequate in all respects.

i. The gunner did not have an adequate or safe seating arrangement that would allow proper positioning behind the minigun.

SECTION III

OBJECTIVE 2 - EMPLOYMENT

13. GENERAL

The Night Hawk combined a night surveillance system, which incorporated a searchlight capable of providing both infrared and white light and a night viewing device, and the 7.62 minigun. This provided a single aircraft with the capability to (1) conduct search operations at night in a covert manner and (2) illuminate a detected target and then attack it with organic firepower. Many different approaches were tried in search of optimum precedures for employing Night Hawk. Various tactics and techniques were employed until most units established fairly standard procedures. This section will be devoted to describing those most commonly used.

14. PROCEDURES

a. When units first employed the Night Hawk system, they were flying maximum hours on every available system. The aircraft were flown in random search patterns over likely avenues of enemy movement, such as rivers, trails, woods and open areas.

b. By 1 October 1969, when this evaluation started, enough experience had been gained to provide for more selective employment. The division G2 and smaller unit intelligence sections provided current intelligence for targeting the Night Hawk. Employment became more productive and better controlled. As operational procedures for Night Hawk were refined, it became standard practice to employ one system in support of each brigade. This provided sufficient coverage under most situations. Many factors were considered, including the enemy and friendly situations, terrain, size of area and aircraft and crew members available.

15. TACTICS AND TECHNIQUES

a. Discussion

Results obtained from Night Hawk operations varied depending on time and location of employment.

(1) Results

At the start of Night Hawk operations, units enjoyed good success, but the number of confirmed kills tapered off as more systems became operational. The decrease was attributed to the enemy's passive counteractions taken in response to his increased awareness of the Night Hawk capabilities. Also, results obtained by the use of Night Hawk were in direct proportion to the level of enemy activity, which was low throughout the evaluation period. Total results compiled by the nine systems during the 30-day period were 86 enemy killed and 16 sampans destroyed.

(2) Terrain

Effectiveness was influenced by terrain. Figure III-1 illustrates, by percentage, the missions flown over different types of

terrain and cover. Night Hawk was virtually useless over dense jungle canopies and was cautiously employed in mountainous terrain. Targets could not be located using white or infrared light in areas where heavy jungle vegetation, consisting of double or triple canopy, existed. Neither visual nor infrared light would penetrate this growth. Similarly, targets were difficult to locate in mountainous terrain because of difficulty experienced by pilots navigating over rough terrain and maintaining an optimum air speed and altitude. Greater success was obtained in areas where terrain was flat or rolling and vegetation was less dense. During the evaluation a distinction was made between flat dry and flat wet terrain to denote the peculiarity of specific areas in which test units operated. Employment of the Night Hawk system was not affected by this terrain distinction, however, target types, i.e. sampans versus troops in the open, were identified with a specific type terrain.

b. Techniques of Employment

Various tactics and techniques were experimented with in an effort to develop the best application of the system.

(1) Airspeed and Altitude

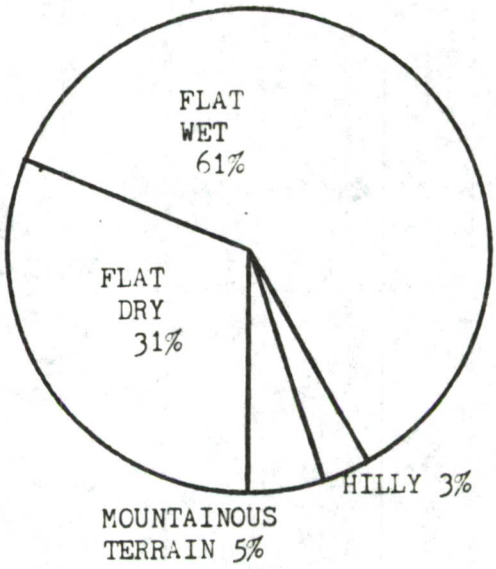
Figure III-2 graphically displays the airspeed and altitude options reported by the 1st and 25th Infantry Divisions. Several factors served to limit the options available to the user; these were: the ability of the observer to detect targets through the NOD; the limiting characteristic of the NOD and the helicopter's safety of flight operating limitations. Following interviews with the Night Hawk crews and an analysis of reported flight profiles, an optimum airspeed of 50 knots and an altitude of 500 feet above the ground were selected. This optimum operating criterion was therefore a compromise between operational effectiveness and safety.

(2) Crew Composition

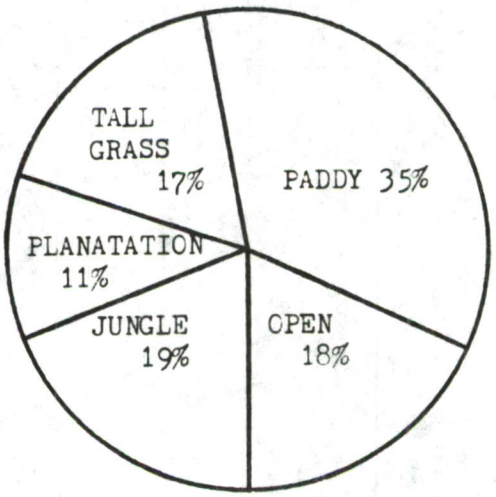
Commanders soon recognized the importance of having experienced, well-trained crews to man the Night Hawk aircraft, so units assigned permanent crews. Results achieved with these crews showed a marked improvement over those obtained with crews that were continously rotated through Night Hawk duty.

(3) Aircraft

One unit could afford to dedicate aircraft to Night Hawk operations. Again, results reflected improved effectiveness. Aircraft and Night Hawk systems received better maintenance and experienced fewer breakdowns. The separate brigade having only four assigned aircraft could not afford this luxury, nor could the infantry division. In these units, Night Hawk systems were removed at the end of the night missions and the aircraft configured for daylight operations. While a Night Hawk system could be removed in about 30 minutes, it took up to 1½ hours to reinstall.

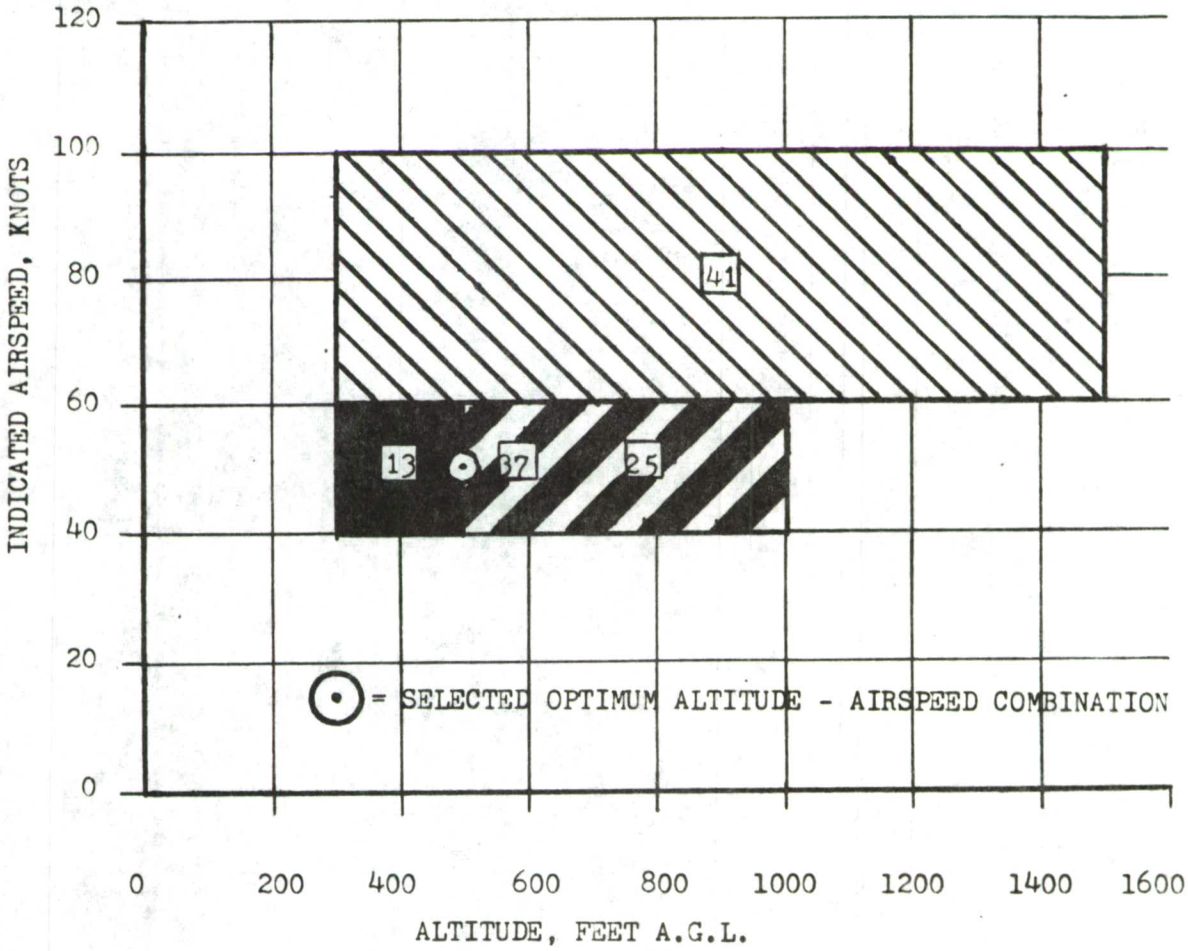


DISTRIBUTION OF MISSIONS
FLOWN BY TERRAIN TYPE



DISTRIBUTION OF MISSIONS FLOWN
BY VEGETATION TYPE

FIGURE III-1. Percentage of Missions Flown Over Various Terrain and Vegetation



LEGEND: Cross hatched and solid areas are arbitrary divisions of the flight envelope. Boundaries of the crossed hatched area have significance only for this evaluation.

FIGURE III-2. Number of Flights at Various Altitudes and Airspeeds.

(4) Navigation

There is no accurate position-fixing navigation system on the UH-1. Ground controlled approach (GCA) radar is the best means available within its range capabilities; however, it cannot always provide coverage throughout the Night Hawk's area of operation. Two of the three units had no GCA with which to assist Night Hawk. Although pilotage was relied on at all times, this often failed to provide the accuracy desired. Targets detected could not be engaged unless an accurate position fix could be reported to the supported unit. Wherever possible, specified strike zones were assigned to Night Hawk aircraft. This eliminated the need for pinpoint accuracy in position fixing as long as the aircraft was within the assigned area. In addition, Night Hawk operations require good visual weather conditions. Missions cannot be performed under adverse visibility conditions that are below normal safe limits.

(5) Escort Aircraft

Night Hawk aircraft were capable of operating alone, and did so in many cases; however, escort aircraft were used when available. Escort aircraft used either another UH-1D/H or a gunship, AH-1G or UH-1C. Neither type possessed distinct advantages over the other, so the aircraft selected depended on what was most readily available. The 1st Infantry Division found that, when an escort aircraft was employed, Night Hawk's effectiveness ran much higher than on unescorted missions. The escort aircraft was capable of providing much assistance. Some of its functions included maintaining Night Hawk communications with artillery and the supported unit; recovery, if required; navigation; protection; additional firepower; and illumination. Due to black-out operating conditions, the crew members of a Night Hawk were under strong psychological stresses; these stresses were particularly heavy on the aircraft commander. The mere knowledge that an accompanying aircraft was along to assist, in the event something went wrong, reduced tension and resulted in more concentrated effort.

(6) Targeting

Since achieving the initial successes previously mentioned, few positive results have been obtained while operating above well established routes and suspected areas. Undoubtedly there are some intangible effects achieved by the restrictions Night Hawk imposes on the enemy's freedom of movement; but to be truly effective targeting must be based on sound intelligence information. With the demonstrated capability of responding in minutes, Night Hawk proved to be invaluable to the commander for verifying ground sensor reports. Many times Night Hawk was called on to check ground radar sightings in the vicinity of base camps. On some of these occasions this system was credited with preventing completely or considerable reducing the effectiveness of an enemy ground attack. On other occasions, when Night Hawk was tasked to investigate mechanical ambush activations, crews discovered enemy troops either dazed by the ambush explosions or occupied with the burial and/or evacuation of the victims.

(7) Enemy Trends

Although credited with being devious and skillful, the enemy has established some fairly predictable operational patterns and habits that were discovered or confirmed by Night Hawk operations. Some of these are listed below:

(a) Movements of troops and supplies were accomplished during the evening hours from just after last light until midnight. Planned attacks against friendly encampments usually were initiated between shortly after midnight and 0300 hours.

(b) The majority of water movement took place during high tide conditions.

(c) The enemy frequently used flashlights when moving along jungle trails. Although his light discipline was good, the Night Hawk NOD could detect the flicker of flashlights through the jungle canopy.

(8) Crew Training and Proficiency

As with employment of any system by two or more individuals, teamwork was essential for effective operations. This was especially true with the Night Hawk system. Due to fatigue, gunners were cross-trained on the observer's duties and vice versa. Night Hawk crew members normally rotated jobs about every 30 minutes. Some units had two complete crews trained and proficient for each assigned system. Only the best qualified aviators were assigned as aircraft commanders on Night Hawk aircraft. When available, instrument-qualified aviators were used.

16. FINDINGS

a. In most situations, it became standard practice to employ one Night Hawk system in support of each brigade.

b. The optimum airspeed and altitude above ground level determined from this evaluation are 50 knots and 500 feet respectively.

c. The Night Hawk system has little value for operations over heavy jungle and mountainous terrain.

d. Night Hawk is most effective when units are able to dedicate aircraft and crews to its employment.

e. The lack of accurate, on-board position fixing equipment is the second greatest limitation to the use of Night Hawk.

f. The use of escort aircraft significantly enhances the effectiveness of the Night Hawk system.

g. Night Hawk is employed more gainfully when reliable intelligence information is available for selecting the area of operations, rather than when assigned to a free-search mission.

h. Crew training is critical for effective Night Hawk employment.

SECTION IV

OBJECTIVE 3 - SYSTEM SUPPORT

17. OPERATIONAL TIME

During this evaluation, 755 hours were flown on the nine systems used. Searchlights and NODs were operated continually during this time. Reporting was not consistent enough to establish accurately the number of rounds fired from the minigun.

18. FAILURES AND MAINTENANCE REQUIREMENTS

Surprisingly few component failures of the Night Hawk system were reported. Insufficient data was collected on maintenance and supply requirements to enable the evaluators to determine logistical support needs.

a. AN/TVS-4 NOD

No maintenance failures of the NOD were reported. Extra batteries were carried for replacements as required. Average battery life was approximately 8 hours. NODs were carefully cleaned and kept covered when not in use. Very little maintenance time was required.

b. AN/VSS-3 Searchlight

(1) Three malfunctions were reported during the evaluation. Two were due to power interruptions caused by the observer inadvertently kicking the power cable loose from its terminal, and the third was due to a jammed focus control. These malfunctions were repaired by direct support maintenance. Some lost mission time resulted from these incidents, but they did not cause complete mission aborts.

(2) The searchlight required only a few minutes of daily maintenance for inspection and cleaning.

c. M134 Minigun

(1) Malfunctions occurred frequently with the miniguns due primarily to dirty or misaligned ammunition or poor firing techniques. Guns mounted in the left door were often jammed by expended links being blown into the rotating mechanism by the windstream. Two instances of broken drive cables were reported. Except for the problem with expended links, all stoppages were common to those experienced with the M134 in other applications. The link problem was corrected by using a locally fabricated chute to direct expanded links clear of the weapon. Another solution used the link chute from the XM27E1 system, this was also effective. Most weapon stoppages caused the Night Hawk to discontinue its mission until the jam could be cleared. By carrying extra feeder-delinkers for every weapon, some stoppages were quickly cleared in flight.

(2) Maintenance of the M134 minigun presented no unusual requirements.

19. LEVEL OF MAINTENANCE

All maintenance of the Night Hawk system was accomplished at unit level except for one searchlight failure, which was repaired by direct support maintenance.

20. FINDINGS

The Night Hawk system is reliable. Only minor maintenance is required, much of which can be performed by organizational maintenance personnel.

21. OBJECTIVE 4 - BOI

A BOI for the Night Hawk was difficult to establish because of the many variables involved. Unit mission, size of area of operation, type of unit, enemy situation and personnel and aircraft availability were considered. When allowed unrestricted operation, Night Hawk covered a large area in a relatively short period. During the evaluation one Night Hawk was generally employed in each brigade-size area of operation. Experienced operations personnel in brigade and division sized units were unable to provide adequate statistical data to allow a precise determination for a BOI. Therefore, the following provisional BOI was established as a guide. It is a deliberately cautious recommendation, but can be sustained by reasonable objective military observations. Specific requirements for a BOI must be established on an individual basis until more field experience is gained. A suggested BOI follows:

TYPE UNIT	NO. OF SYSTEMS
Infantry Division	4
Airmobile Division	8
Separate Brigade	1
Armored Cavalry Regiment	2
Separate Air Cavalry Squadron	3
Combat Aviation Group	as required.

SECTION VI

CONCLUSIONS AND RECOMMENDATIONS

22. CONCLUSIONS

a. As a helicopter-borne system, Night Hawk is effective for target acquisition and destruction at night and is suitable for employment in the combat environment in RVN.

b. The Night Hawk system has the following capabilities:

(1) With the exception of dense jungle, Night Hawk provides a means for covertly observing specific locations at night.

(2) This system can respond rapidly to combat commanders' requests or to fresh intelligence reports.

(3) Night Hawk incorporates an integral weapons system well suited for destruction of small boats and personnel.

(4) By employing the searchlight in the visible light mode, small area illumination can be provided.

(5) Aircraft used for Night Hawk systems employment are standard UH-1D/H helicopters, which require no modifications. Installation of the Night Hawk system takes 1½ hours; removal takes only 30 minutes.

(6) All Night Hawk components, except the locally fabricated mounts, are standard items of equipment available from assets in RVN, and are recoverable for use as originally intended.

(7) Under most situations, one Night Hawk system can provide adequate support to one brigade-size area of operations.

c. Night Hawk is subject to the following limitations:

(1) The helicopter must operate in visual flight weather conditions.

(2) Effectiveness of Night Hawk varies inversely with the density of the jungle canopy; it is virtually useless over dense jungle.

(3) Firepower is limited by the amount of ammunition available.

(4) Night Hawk does not have on-board position-fixing navigation system; therefore, it must rely on pilotage and/or ground radar for accurate positioning.

23. RECOMMENDATIONS

It is recommended that:

a. Night Hawk be adopted as an interim system for use by units throughout RVN.

b. The Night Hawk system be distributed to meet unit requirements based upon area of operations, unit mission, and availability of aircraft and system components as recommended in the proposed BOI contained in paragraph 21.

c. The development of a standardized Night Hawk mounting kit be initiated under the VLAPA program.

d. A foot-operated microphone switch for the gunner's and observer's stations be installed under the provisions of MWO 55-1520-210-30/27.

e. The Big Screen Night Observation device be incorporated in the Night Hawk system to replace the AN/TVS-4.

f. The feasibility of developing a portable gunner's seat, to meet appropriate safety standards, be investigated.

g. A flash suppressor for the 7.62 minigun, -- corresponding to the type being tested by the Research and Engineering Directorate, Aircraft Weapons Systems Laboratory, Guns and Components Branch, US Army Weapons Command, Rock Island, Illinois, -- be procured.

h. The Night Hawk systems' allied aircraft equipment be tested and flight qualified under the provisions of Army Regulations 70-10 and 385-16 (Safety for Systems, associated Subsystems and Equipment).

i. The doctrine for employment of this system state explicitly that it will be normally employed with an escort helicopter.

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DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY *(Corporate author)*

Army Concept Team in Vietnam
APO San Francisco 96384

2a. REPORT SECURITY CLASSIFICATION

FOUO

2b. GROUP

3. REPORT TITLE

EVALUATION OF THE NIGHT HAWK SYSTEM

4. DESCRIPTIVE NOTES *(Type of report and inclusive dates)*

Final Report 1 October 1969 - 30 October 1969

5. AUTHOR(S) *(First name, middle initial, last name)*

Charles M. Hickerson, LTC FA

6. REPORT DATE	7a. TOTAL NO. OF PAGES	7b. NO. OF REFS
30 January 1970	32	0

8a. CONTRACT OR GRANT NO.	9a. ORIGINATOR'S REPORT NUMBER(S)
b. PROJECT NO. ACA-2/70I	ACTIV Project Number 2/70I
c.	9b. OTHER REPORT NO(S) *(Any other numbers that may be assigned this report)*
d.	

10. DISTRIBUTION STATEMENT

In addition to security requirements which apply to this document and must be met, each transmittal outside the Department of Defense must have prior approval of CG, USARV.

11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY
None	U.S. Army, Vietnam APO San Francisco 96384

13. ABSTRACT

The Night Hawk system was evaluated by ACTIV during the period 1 October to 30 October 1969. The purpose of the evaluation was to determine the suitability of the Night Hawk system for combat operations in the Republic of Vietnam (RVN) and, if acceptable, to recommend a basis of issue (BOI). The Night Hawk system was evaluated during night operations by three units located in the III Corps Tactical Zone. Analysis of evaluation data resulted in the following recommendations:

a. That the Night Hawk system, consisting of three basic components: a AN/VSS-3 Searchlight, a Night Observation device, AN/TVS-4 or a Big Screen Night Observation device, and a pintal mounted 7.62 minigun, be adopted as an interim system for use by units throughout RVN.

b. The Night Hawk system be distributed to meet unit requirements based upon area of operations, unit mission, and availability of aircraft and system components as recommended in the proposed BOI contained in paragraph 21, subject report.

c. The development of a standarized Night Hawk mounting kit be initiated under the VLAPA program.

d. A foot-operated microphone switch for the gunner's and observer's stations be installed under the provisions of MWO 55-1520-210-30/27.

e. The Big Screen Night Observation device be incorporated in the Night Hawk system to replace the AN/TVS-4.

DD FORM 1 NOV 68 1473 REPLACES DD FORM 1473, 1 JAN 64, WHICH IS OBSOLETE FOR ARMY USE.

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Security Classification

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Night Hawk System						
Night Observation Device (NOD) AN/TVS-4						
Xenon Searchlight AN/VSS-3						
Big Screen Viewer						
Gun System M134 Minigun						

13. Abstract (cont)

f. The feasibility of developing a portable gunners seat, to meet appropriate safety standards, be investigated.

g. A flash suppressor for the 7.62 minigun, -- corresponding to the type being tested by the Research and Engineering Directorate, Aircraft Weapons Systems Laboratory, Guns and Components Branch, US Army Weapons Command, Rock Island, Illinois, -- be procured.

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